Y/03009 February 28, 2003

TO: Distribution

FROM: Y/DC-8 Mission Manager, Airborne Science Directorate

SUBJECT: SOLVE II Experimenter Bulletin #2 - Mission Summary

This bulletin summarizes NASA DC-8 support for the second SAGE III Ozone Loss and Validation Experiment (SOLVE II) Mission. DC-8 payload integration began November 18, 2002, at NASA Dryden Flight Research Center (DFRC). The DC-8 deployed to Kiruna, Sweden on January 8, 2003 and returned to DFRC on February 6, 2003. A total of 148 flight hours were used. A final account of flight hours can be found in enclosure (1).

1.0 MISSION DESCRIPTION AND OBJECTIVES

The second SOLVE II Mission was an international field campaign designed to acquire correlative data needed to validate the Meteor-3M/Stratospheric Aerosol and Gas Experiment (SAGE) III satellite mission. Correlative measurements were also to be acquired for the ADEOS-II and ENVISAT satellite missions to enhance comparisons and ozone loss studies. The DC-8 deployment was timed to coincide with the deployments of the Deutsche Forschungsanstalt für Luft und Raumfahrt (DLR) Falcon and a Russian Geophysica M55 aircraft, which were participating in the Validation of International Satellites and Study of Ozone Loss (VINTERSOL) campaign, a European sponsored science program also based in Kiruna. Several flights of the DC-8 were coordinated with the Falcon and Geophysica, as well as with balloon launches and ground observations.

SOLVE II has been co-sponsored by NASA's Upper Atmosphere Research Program (UARP), Atmospheric Effects of Aviation Project (AEAP), Atmospheric Chemistry Modeling and Analysis Program (ACMAP), and Earth Observing System (EOS) of NASA's Earth Science Enterprise (ESE). Drs. Michael Kurylo and Phil DeCola are the SOLVE II Program Scientists. Drs. Mark Schoeberl and Paul Newman are the SOLVE II DC-8 Project Scientists, and Mr. Michael Craig and Mr. Steve Hipskind are the SOLVE II Project Managers.

The NASA DC-8 was used to pursue five basic science objectives for SOLVE II. Data was acquired for:

1. SAGE III instrument validation
2. Polar stratospheric cloud (PSC) measurements
3. Photochemical process studies
4. Polar air transport and dynamics measurements
5. Polar ozone loss rate measurements

A total of 12 local flights were flown from Kiruna. Objectives for each flight were determined based on on-going meteorological observations and modeling, and ranged from time and location rendezvous for satellite coincidence or ground station overpass, to long polar vortex transects. Targets of opportunity (PSC's) were occasionally pursued. With the exception of one flight, which returned early, the DC-8 successfully accomplished every objective set forth. The ultimate success of the mission is now dependent on the analysis of the data. Reports for each flight can be found on the web at: http://cloud1.arc.nasa.gov/solveII/index.html.

The SOLVE II payload consisted of eleven experiments. Two additional experiments, "Differential GPS" and "Airglow," were "piggy backers" on the payload. The objective of the GPS experiment was to test high precision differential GPS equipment in a semi-autonomous mode, at high latitudes, and as an augmentation to other experiments on the aircraft. These objectives were met. This instrument may become a facility capability for the DC-8. The Airglow experiment's objective was to collect Near IR video sky imagery during night flight operations. A substantial portion of the DC-8 flight time was in night conditions, and the Airglow camera was operated at every opportunity.

2.0 OPERATIONS

Payload integration started on schedule. After a very smooth and efficient installation, the DC-8 rolled out of the hangar two days early to begin outside laser calibrations and alignments. Four successful experimenter test flights were flown locally from DFRC before the DC-8 transited to Kiruna, Sweden on January 8. Accommodations at our base, the Arena Arctica Hangar at the Kiruna Airport, were excellent. Once again, the Kiruna Airport Authority provided all required ground support equipment, including two custom made service stairs designed and fabricated specifically for the DC-8. The Ames Research Center SOLVE II Program Office did an outstanding job of taking care of the myriad of logistical details required for a science and operations team of nearly 100 people. This included an intranet to the various work areas in the hangar, fax and copy machines, a message phone, and shipping and receiving.

Local flights from Kiruna departed on schedule. No flights were cancelled due to weather; however, the DC-8 was forced to divert once to Lulea, Sweden for landing due to adverse runway conditions at Kiruna. The DC-8 returned to Kiruna the following day. Nearly all flights were between 9 and 10 hours duration, and occurred every other day. Nevertheless, the DC-8 maintained a record of 100% readiness for all flights requested.

The majority of flight operations occurred between Sweden and Greenland, over the Greenland and Norwegian Seas. Several flights over flew the a ground station at Nye Alesund on Spitzbergen Island, and two flights ranged to within 1.5 nm of the North Pole. Although two flights penetrated Russian controlled airspace, unlike the SOLVE I mission, there were no over flights of Russian territory for SOLVE II.

Upon return to DFRC, the DC-8 was unloaded and the instruments de-integrated within four days. By the middle of the following week, all experiment teams had returned to their home institutions.

3.0 FLIGHT REQUESTS AND INSTRUMENT PAYLOADS

The following NASA Flight Requests were satisfied:

Flight Request No.	Study Name	Principal Investigator	Affiliation
38014	Second SAGE III Ozone Loss and Validation Experiment (SOLVE II) Mission	Steve Hipskind	NASA ARC
38034	Differential GPS for SOLVE 2 DC-8 Mission	John L. LeBrecque	NASA JPL
38033	NIR Airglow Imaging	Michael Taylor	Utah State Univ.

The DC-8 payload for SOLVE II consisted of the experiments summarized in the table below.

Experiment	Instrument	Principal Investigator
DIAPER DC-8 In-situ Aerosol Parameter Experiment Rack	Condensation particle counters, aerosol spectrometer probes, nephelometer, aethelometer	**Bruce Anderson** NASA Langley Research Center M/S 483 Hampton, VA 23681-0001
FASTOZ High Resolution In-Situ Ozone	Nitrogen Oxide Analyzer and Probe	**Melody Avery** NASA Langley Research Center M/S 483 Hampton, VA 23681-0001

DIAL Differential Absorption Lidar	UV DIAL III (Differential Absorption Lidar) Lidar investigations of Ozone and aerosols	**Edward V. Browell** NASA Langley Research Center M/S 401A Hampton, VA 23681-0001
DACOM / DLH Differential Absorption CO Measurement / Diode Laser Hygrometer	Measurements of Tropospheric CO, CO2, CH4, N2O, H2O(v)	**Glenn Diskin** NASA Langley Research Center M/S 472 Hampton, VA 23681-0001
PANTHER PAN and other Trace Hydrocarbons Experiment	Gas chromatograph-mass spectrometer, electron capture gas chromatographs & probe	**James Elkins** National Oceanic and Atmospheric Administration M/S R/CMDL1 325 Broadway Boulder, CO 80305-3325
MTP Microwave Temperature Profiler	Radiometer retrieves profiles of air temperature for a 20km region centered on flight altitude	**Michael J. Mahoney** Jet Propulsion Laboratory M/S 246-101 4800 Oak Grove Dr Pasadena, CA 91109
AROTAL GSFC/LaRC - Aerosol, Ozone, and Temperature LIDAR	Backscatter / DIAL / Raman Lidar	**Thomas McGee / John Burris** NASA Goddard Space Flight Center Code 916 Greenbelt, MD 20771-0001 **C. A. Hostetler** NASA Langley Research Center M/S 435 Hampton, VA 23681-0001
GAMS / LAABS Gas and Aerosol Measurement Sensor & Langley Airborne A-Band Spectrometer	Solar spectrometer and high-resolution spectrometer	**Michael C. Pitts** NASA Langley Research Center M/S 475 Hampton, VA 23681-0001
NCAR DIAS Direct Beam Solar Irradiance Spectroradiometer	Scanning Spectroradiometer UV and Visible Irradiance Measurements	**Richard E. Shetter** National Center for Atmospheric Research 1850 Table Mesa Dr Boulder, CO 80303
FCAS/NMAS Focused Cavity Aerosol Spectrometer / Nucleation-mode Aerosol Size Spectrometer	Particle Size Distribution Measurements	**Michael Reeves** Dept. of Engineering, Rm 200 University of Denver 2390 South York Street Denver, CO 80208-0177

AATS-14 NASA Ames Airborne Tracking Sunphotometer	Fourteen channel tracking sunphotometer for measurements of aerosols, water vapor, and ozone.	**Phillip Russell** NASA Ames Research Center M/S 245-5 Moffett Field, CA 94035-1000
Differential GPS Experiment	GPS antenna, Iridium Telephone connection, and rack mounted processor.	**John LaBrecque** Jet Propulsion Laboratory M/S 233-200 4800 Oak Grove Dr Pasadena, CA 91109
NIR Airglow Imaging	Near IR CCD Video Camera and VCR	**Michael Taylor** Physics Department Utah State University 4405 Old Main Hill Logan, UT 84322-4405

In addition to the experimental instruments, the following standard DC-8 mission support systems were in operation:

1. Information Collection and Transmission System (ICATS) for flight, navigation, and atmospheric data outputs to the experiments,
2. Heitronics KT-19 IR Pyrometer, 2 degree FOV in the 9.6 - 11.5 micron spectral band,
3. Forward and nadir viewing video cameras,
4. Buck Research Model 1011C two stage, thermoelectric hygrometer,
5. Color weather radar with video output capability,
6. Automatic Picture Transmission satellite weather receiver station, receiving weather information directly from polar orbiting satellites, and
7. Inmarsat Aero H satellite telephone communication system

Videotapes from the forward and nadir cameras will be forwarded to the NASA Ames SOLVE II Program Office for archive.

4.0 COORDINATION OF OPERATIONS

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In terms of operations, this mission had very few problems. The DC-8 flight and ground crews handled those problems that did arise quickly and safely, and with minimal if any impact to science. The DFRC Airborne Science Directorate appreciates the opportunity to serve the Earth Science Enterprise and looks forward to further opportunities.

Christopher R. Miller

Enclosures (1)

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